# ToF-SIMS in solid state chemistry and physics

Luca Tortora[1,2]
[1]Department of Sciences, Roma Tre University, 00146 Rome, Italy
[2]National Institute for Nuclear Physics (INFN), Roma Tre Division, 00146 Rome, Italy

Understanding the physical and chemical processes occurring at the interface in organic, inorganic, or hybrid multilayered structures is a key aspect in solid state chemistry and physics. In microelectronics, depth profiling experiments are usually aimed to investigate just the dopant distribution or abrupt compositional variations in the device via elemental analysis of few inorganic species. Actually, the evolution of the ion beam technology gave scientists the opportunity to study the spatial distribution of more complicated molecules and compounds in sophisticated architectures adopted, for example, in organic electronics.

The very shallow dopant distribution can play a crucial role also in the synthesis of graphite intercalation compounds (GICs). The intercalation of ions in graphite is nowadays a fundamental topic for massive graphene production, electrodes performances, and energy storage in batteries. However, the current interpretative model about the intercalation process lacks of any insight on local chemical processes that instead influences the final quality of graphene flakes, the stability of electrodes as a function of time and the mechanism of intercalation at the molecular length scale.

In this talk, it will be showed why ToF-SIMS can be considered a valid aid in understanding diffusion and segregation phenomena in hybrid organic/polymer/inorganic OTFTs but also, in a different scenario, unveiling the reaction mechanisms involved in the intercalation process of inorganic ions into graphitic electrodes.

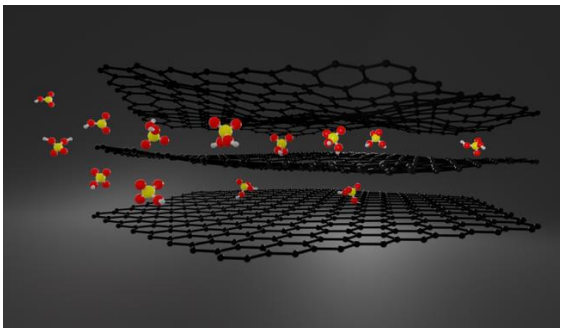

Fig. 1. Intercalation of sulfate ions into Highly Oriented Pyrolytic Graphite

References:

[1] Stratigraphic analysis of intercalated graphite electrodes in aqueous inorganic acid solutions; *Nano Research* 2022, 15(2): 1120–1127

[2] X-ray Detectors With Ultrahigh Sensitivity Employing High Performance Transistors Based on a Fully Organic Small Molecule Semiconductor/Polymer Blend Active Layer; *Adv. Electron. Mater.* 2022, 8, 2200293